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- i) an array of signal acquisition electrodes expandable from a substantially cylindrical shape to an expanded shape, and
  - ii) a catheter plug with multiple connections, each of the connections being electrically coupled to one of said array of acquisition electrodes;
- b) an interface apparatus having;
- i) an interface plug adapted to be connected to the catheter plug to establish electrical connection to each of the electrodes,
  - ii) a voltage acquisition apparatus in communication with the interface plug and coupled to said array of acquisition electrodes, said voltage acquisition apparatus having an analog to digital converter for digitizing voltages on said array of acquisition electrodes, and
  - iii) a signal generator in communication with one or more of said array of voltage acquisition electrodes for generating low current pulses; and
- c) a computer having;
- i) electrical communication with the signal generator of the interface apparatus to control its function,
  - ii) electrical communication with the voltage acquisition apparatus to receive the voltage<sup>s</sup> acquired by the signal acquisition electrodes,
  - iii) processing unit to compute<sup>s</sup> the three-dimensional volumetric electric field distribution based on the voltages received from the signal acquisition electrodes, and
  - iv) a display showing the computed field distribution.
2. The endocardial chamber mapping system of claim 1, wherein the computer further comprises:
- v) means for obtaining data relating to volume and shape of the endocardial chamber through the generation of low current pulses by the signal generator and for creating an image of said volume and shape,
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and wherein the display shows the computed field distribution displayed on the image of the volume and shape of the endocardial chamber.

3. The endocardial chamber mapping system of claim 2, wherein the display shows the computed field distribution in a continuously filled color-scale map shown over the volume and shape of the endocardial chamber.

4. An endocardial chamber mapping system comprising:

a) a catheter assembly having

i) an array of signal acquisition electrodes expandable from a substantially cylindrical shape to a substantially spherical shape, and

ii) an electrical connector plug with multiple connectors electrically coupled to each of the electrodes present in said array;

b) voltage acquisition apparatus in communication with the electrodes of said array, having an analog to digital converter for converting the voltages on said array to corresponding signals; and

c) a computer having

i) an electrical communication with the voltage acquisition apparatus to receive the voltage acquired by the signal acquisition electrodes,

3 ii) a processing unit capable of computing <sup>a</sup>the three-dimensional volumetric electric field distribution based on the signals acquired at the signal acquisition electrodes, and

iii) a display for displaying the three-dimensional volumetric electric field distribution via an iso-potential map overlaid on a display of the heart geometry.

5. The system of claim 4, wherein the iso-potential map is displayed as a continuously filled color-scale map.

REMARKS